Instructions for programming questions.
@authors: Your friendly CS Professors

Exam 1 programming question:
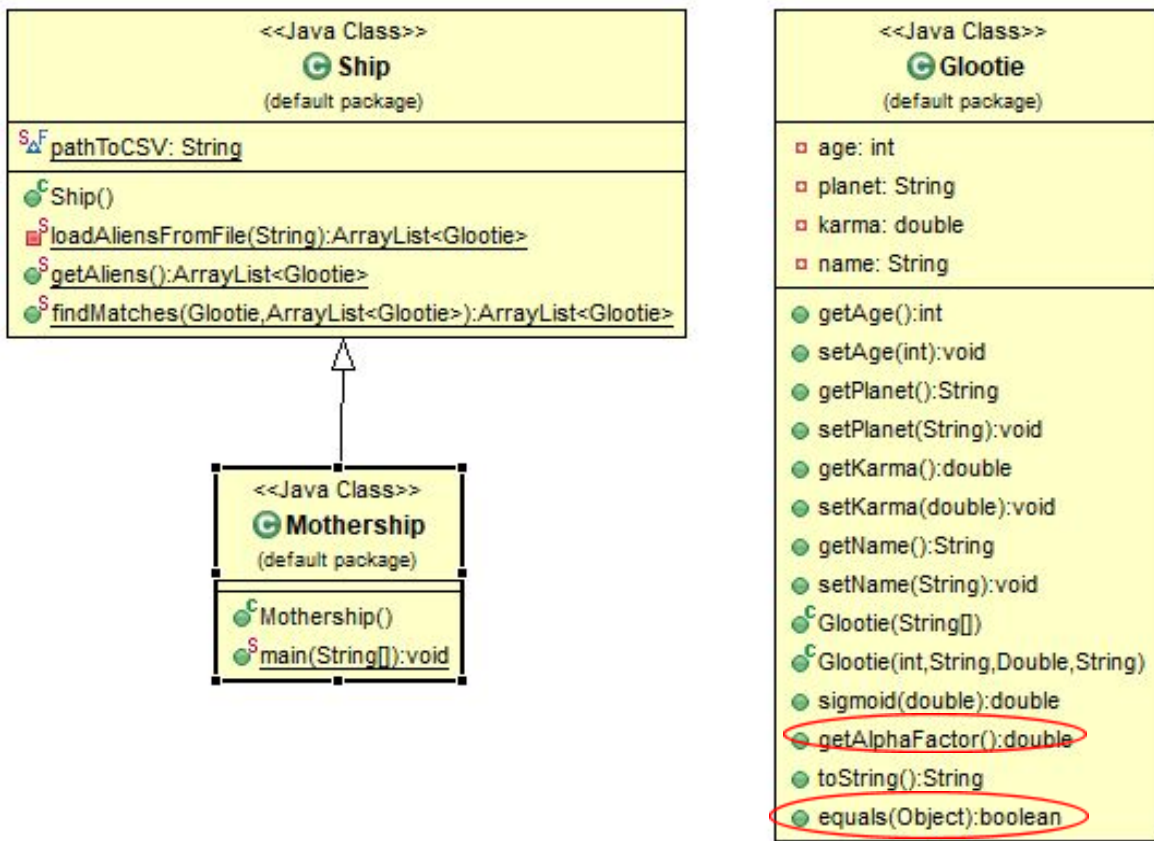
A group of aliens called the Glootie, use machine learning to find their life partners. Each Glootie has the following properties:

1. Name (String)

2. Age (int)

3. Planet (String)

4. Karma (double)

The Glooties' information is stored in a file called AlienLoveBook.csv. The fact that you're reading this means that you've unzipped the folder containing the source code for the alien match making system. This folder should contain 4 files: Glootie.java, Mothership.java, Ship.java and AlienLoveBook.csv. Create a new Java Project called Exam1 and add these java files to the same package and place the CSV file in the Exam1 Project folder but outside of the src folder. You can drag and drop the files into the project. Select the copy option; simply linking the files will give you an error.   If you've set everything up correctly your eclipse package explorer should look like the following: (Remember place the AlienLoveBook.csv file insider of Exam1 project but outside of the src folder)
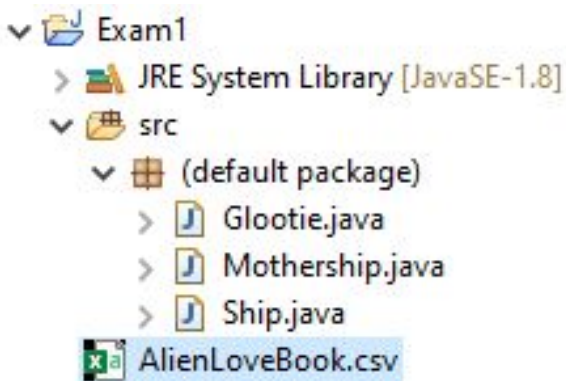
 The UML diagram on the next page illustrates the class designs. You will implement the two functions circled in red : the getAlphaFactor() method, and the equals() method in the Glootie class.

<<Java Class>>	<<Java Class>>

<<Java Class>>
Ⓖ Ship
(default package)

$^{S}_{△}{}^{F}$ pathToCSV: String

^{C} Ship()
^{S} loadAliensFromFile(String):ArrayList<Glootie>
^{S} getAliens():ArrayList<Glootie>
^{S} findMatches(Glootie,ArrayList<Glootie>):ArrayList<Glootie>

<<Java Class>>
Ⓖ Mothership
(default package)

^{C} Mothership()
^{S} main(String[]):void

<<Java Class>>
Ⓖ Glootie
(default package)

▫ age: int
▫ planet: String
▫ karma: double
▫ name: String

● getAge():int
● setAge(int):void
● getPlanet():String
● setPlanet(String):void
● getKarma():double
● setKarma(double):void
● getName():String
● setName(String):void
^{C} Glootie(String[])
^{C} Glootie(int,String,Double,String)
● sigmoid(double):double
● getAlphaFactor():double
● toString():String
● equals(Object):boolean

Part A (2 Points):

Implement the **getAlphaFactor** function. Each Glootie has an alpha factor α. The alpha factor captures each alien's unique love profile. The equations that predict the alpha factor are shown below. This alpha factor is predicted using logistic regression. $\lfloor \rfloor$ represents computing the floor. You can use the java function Math.floor() to compute the floor of a double in java. Here are the values for the variables used in the formula. These variables will always hold these values. b_0 = 0.1, b_1 = 0.5 and b_2 = 0.5. MaxAge = 70. MaxKarma =130

$$\alpha = \lfloor sigmoid\,(b_0 + b_1 * Age/MaxAge + b_2 * Karma/MaxKarma) * 1000 \rfloor$$

The sigmoid function is defined as:

$$sigmoid\,(x) = \frac{1}{1+e^x}$$

The sigmoid maps the output of the linear regression to a value between 0 and 1. These values are often interpreted as a probability. Don't worry you don't have to implement the sigmoid function we have implemented it for you. Implement the **getAlphaFactor()** that calls the sigmoid function.

Run this system by running the main method in MotherShip.java it will print out the alpha factors. Rick's Alpha Factor should be 727.0 , what is Leela's alpha factor? Enter your response in the collab exam. (Enter a value accurate to 1 dp and round up)

Part B (5 points):

The mothership matches Glooties if they're equal. Two Glooties are equal if their calculated alpha factors are the same and they're not from the same planet. **Implement the equals method** in the Glootie.java file. Run the mothership program. What is the name of Rick's match? Enter your answer on Collab. (All letters must be uppercase)

Part C (5 points):

What are the names of Leela's matches. Enter each match separated by a comma (no spaces and all upper case). You will enter your answer into Collab, so the text must match exactly.